These and other aspects of the invention are apparent from and will be elucidated with reference to the embodiments described hereinafter.

In the drawings:

Fig. 1 is a schematic, cross-sectional view of an optical contact document reader, in this example a fingerprint sensing device.

Fig. 2 shows a detail of a fingerprint sensing device.

Fig. 3 shows schematically an image sensor pixel of a 2D image sensor array employing a-Si nip diodes as the matrix switch.

Fig. 4A illustrates the pixel circuit diagram.

Fig. 4B illustrates the resulting waveforms.

Fig. 5 illustrates a drive system block diagram for a 2D image sensor array.

Fig. 6 is a schematic, cross-sectional view of an image sensor plate for an X-ray detector in accordance with the invention.

The Figures are not drawn to scale and corresponding numerals in the Figures refer to the same or similar parts of a device.

Fig. 1 shows schematically a fingerprint sensing device.

Finger 2 touches the fingerprint sensing device. The device comprises a light source 3, a 2D array of photosensitive elements 4 and an optical element 5.

The fingerprint sensing device is shown, by way of example, in more detail in Fig. 2.

The device comprises a transparent substrate 21, a planar light source 3, and an optical element 5 defining optical paths. 2D array 4 having openings 28 through which light can be passed is formed on transparent substrate 21. A backlight module for a liquid light crystal display or an EL planar light source can be utilised for light source 3. 2D array 4 comprises a plurality of picture elements each comprising a photosensitive element 24 and switch elements 22, interconnected by switching lines 25, signal reading lines 26 and bias applying lines 27. Optical element 5 comprises a diffraction grating 32 combined with fiber members 31 and a transparent protective film 33. The components of the optical elements have such a shape that light may be focused upon a finger-contacting area of the transparent protective film located on center parts of the openings 28. Light emitted by the light source 3 passes through the openings 28 of 2D array 4 and fiber member 31, and then the light is bent by the diffraction grating so that it reaches the finger contacting area of transparent protective film 33. When no finger is in contact with the surface of protective film 33, the light is totally

column detect the amount of charge required to recharge the pixel photodiodes during the select period, and these amplifiers also keep the columns at a fixed potential (typically 0 V). The drive system employs LCD row driver chips. Each amplifier chip is connected to an A/D converter. Data are sent to a PC for subsequent processing of the image data. Figs. 4 and 5 illustrate the functioning of a type of fingerprint sensor, but should not be considered to be limitative for the invention which relates to the ITO electrode and the SiN layer, which may be present in other types of fingerprint sensors or image sensors which may use different electronic circuits.

The ITO electrode (within the concept of the invention, the ITO could be doped with, for instance, antimony which is also called ATO (Antimony doped indium Tin Oxide)) is in contact with the SiN layer. The quality of the device and, in particular, the consistency of the data relies on the properties of the ITO electrode. Optical properties (transparency) as well as electrical properties (resistance) play an important role. The invention for its object to improve these properties and, in particular, the reliability of the ITO layer.

To this end an intermediate layer of silicon oxide ($SiO_x$) is provided between the ITO layer and the SiN layer.

For proper functioning of the devices, it is important that the optical properties (in particular, the transparency) and the electrical properties (in particular, the conductance and capacity) of the ITO layer are well known and controlled. Variations of these properties, dependent on whether the ITO layer is used as an electrode for photodiodes or switching diodes (or more complicated structures such as phototransistors), leads to inaccuracy in the image sensors and in the performance of the device, in particular a reduction of contrast. The same applies to LCD devices.

The inventors have found that the ITO layer is often at least partially reduced during manufacture of the device. The reduction of the layer leads to islands of metallic indium being present (or at least parts with a strongly increased metallic indium and tin content). This leads to two changes in the property of the ITO layer, namely, the transparency is reduced and the conductance is increased. Both of these changes reduce the quality of the device. A reduction of transparency reduces the sensitivity of the device (for sensors) or the light output of the device (LCD). An increase of the conductance leads to changes in switching and control voltages, reducing the reliability of the device.